hope of seeing a second edition with a supplementary volume of plates.

In a brief and imperfect notice like the present but scanty justice can be done to a book like the "Pharmacographia," a work which, from the amount of its original matter, the laborious verification of its facts, the accuracy of its references, and the extent of general erudition it reveals, will be received with no grudging welcome, and will be recognised at once and without misgiving as the standard of authority on the subjects of which it treats.

HENRY B. BRADY

SULLY'S "SENSATION AND INTUITION"

Sensation and Intuition: Studies in Psychology and Æsthetics. By James Sully, M.A. (Henry S. King and Co.)

A YOUNG aspirant to the woolsack had as part of his first examination the question, "To whom was the Declaration of Rights presented?" To refresh his memory he cast his eyes on the paper of the gentleman on his left, who had written William I.; willing to give himself every advantage, he next stole a glance at the paper of the gentleman on his right, where he saw William III. "Ah!" thought he, with a knowing twinkle of the eye, "I'll strike the happy medium"—and down went William II. Mr. Sully, in the first of this collection of interesting essays, has struck the happy medium between the evolution and the individual experience psychologies.

Mr. Sully has read and pondered all the learning of his subject; but the thoroughgoing evolutionist is not unlikely to accuse him of having done more than "shaded for a moment the intellectual eye from the dazzling light of the new idea." If, as we are told, "it is far from improbable that a fuller investigation of the processes by which our conceptions of *space* are built up, will render superfluous the supposition of their innateness," it is not at all probable that *any* other conceptions are inherited. And the evolutionist will not, we fear, be able to draw much comfort from the assurance that "the psychologist, when satisfied of the presence of distinct mental phenomena not traceable to the action of his own laws, will gratefully avail himself of the additional hypothesis supplied to him by the philosopher of evolution;" for it not unfrequently is very difficult indeed to satisfy the psychologist of the presence of anything not traceable to the operation of his own laws. An authority in psychology writing in "Chambers's Encyclopædia," says that the assertions with regard to the instinctive perceptions of distance and direction by the newly hatched chick are, "in the present state of our acquaintance with the laws of mind, wholly incredible." We now know that the chick has not the least respect for those laws of mind; and we have already in these columns (NATURE, vol. vii. p. 300) argued that we have no sufficiently accurate acquaintance with the alleged acquisitions of infancy to justify the doctrine that they are different in kind from the unfolding of the inherited instincts of the chicken. To what we then said Dr. Carpenter has replied on one point in his "Mental Physiology" (p. 179). While admitting that human beings require no education to enable them "to recognise the direction of any luminous object," he maintains "that the acquirement of the power of visually guiding the muscular movements is *experiential* in the case of the human infant." In support of this somewhat inconsistent position, he gives facts within his own knowledge which we do not feel to be in the least inimical to the doctrine against which they are arrayed. Mr. Sully is more consistent; he thinks it proveable that the eye has no instinctive knowledge of either the distance or the direction of a visual object. He relies greatly on "Recent German Experiments with Sensation" (the subject of his third essay), which, like Dr. Carpenter's facts, appear to us in perfect harmony with the theory they are supposed to disprove. Without doubt, there is no higher scientific authority than Helmholtz, and just for this reason is it specially instructive to observe how readily even he accepts as statements of fact what never could have been more than the suggestions of theory. In the last of his admirable course of lectures on "The Recent Progress of the Theory of Vision," he says: "The young chicken very soon pecks at grains of corn, but it pecked while it was still in the shell, and when it hears the hen peck, it pecks again, at first seemingly at random. Then, when it has by chance hit upon a grain, it may, no doubt, learn to notice the field of vision which is at the moment presented to it." In this list of assertions, even the one that might seem most certainly true is a mistake. The chicken does not peck while still in the shell; though that it does so is, we believe, the universal opinion, the actual mode of self-delivery having never been observed. The movement is just the reverse of pecking. Instead of striking forward and downward (a movement impossible on the part of a bird packed in a shell with its head under its wing), it breaks its way out by vigorously jerking its head upward and backward, while it turns round within the shell. With the advance of knowledge, theories will have, though it may be reluctantly, to accommodate themselves to facts; and after the din of the battle is over, it will be found that the real facts had never had any difference among themselves.

Mr. Sully differs from Mr. Spencer as to the relation of the evolution hypothesis to the question of realism and idealism. He is aware that Mr. Spencer "distinctly affirms that the reality of an independent unknowable force is necessarily involved in his theory of evolutional progress. But this," Mr. Sully observes, "can only mean that every distinct conception of subject and object involves this postulate; and this assumption can hardly fail to strike one as a *petitio principii*, inasmuch as able thinkers have undertaken to find the deepest significance of this antithesis in purely phenomenal distinctions." Perhaps Mr. Spencer might be able to produce instances in which the facts of the universe have turned out not exactly what able thinkers had undertaken to find them. Considerable strain is put by Mr. Sully on Mr. Mill's formidable definition of matter—that it is "a permanent possibility of sensation;" but we greatly fear that when brought to close quarters the idealist that puts his trust in this verbal monstrosity will find himself left in the lurch. Somehow through "processes of repeated experience and sharpened intellectual action, the mind comes," we are told, "to conceive a possible impression as the originating cause of a present one, and so to arrive at that vast stream of objective events which flows on beyond,

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and independently of, the actual series of feelings making up its own individual life." To follow this from the idealist's point of view is quite beyond us. A belief in permanent possibilities of sensation that flow on independently of our feelings is in some danger of being mistaken for realism. Mr. Sully, however, is very sure that the realists are wrong; and as a psychologist he must be able, by aid of his science, to explain their error, just as an astronomer accounts for an eclipse. This is how our realistic philosophers go wrong. Under the influence of a refined sentiment of awe, they see what is not there. Not only does this emotion "lead the mind to anticipate the presence of insoluble mystery where a calmer intellectual vision sees only clear regularity, but it serves to support conceptions of an unknowable where the closest observation and most accurate reasoning fail to detect any signs of such an existence." The superstitious terror of the rustic transforms a white calf into a ghost; the awe of the philosopher sees a ghost where there is no calf.

In a very suggestive essay Mr. Sully handles the difficult subject of "Belief: its Varieties and its Conditions." He finds "the primitive germ of all belief, the earliest discoverable condition that precedes in its influence that of action, in the transition from a sensation to an idea." In thus attempting to understand how the state of mind called belief resembles, differs from, and is related to other states of consciousness, Mr. Sully is, we think, on the right track. He is, however, by no means free from the crude, popular notion, that belief and volition, considered as facts of consciousness, have some special causal connection with the bodily movements. Indeed, he thinks that Prof. Bain "has succeeded most completely in showing the will to be a secondary and composite state of mind, inferable from more rudimentary states," one of these so-called rudimentary states being spontaneous bodily movements, which occurring by "a coincidence purely accidental" along with states of consciousness, these unlike things get somehow stuck together by "an adhesive growth, through which the feeling can afterwards command the movement." We have repeatedly maintained that while on the one hand there are reasons which seem to compel the belief that on his physical side man is a machine whose movements can never escape by a hair's breadth from the inexorable rule of physical law, there is on the other hand no "better ground for the popular opinion that voluntary movements take their rise in feeling and are guided by intellect, than a superficial observer ignorant of the construction of the steam-engine might have for a belief that the movements of a locomotive take their rise in noise and are guided by smoke."* That Prof. Huxley's bold advocacy of this view at the recent meeting of the British Association has not called out more angry criticism is surely a most hopeful sign of the times.

It is with regret that we must now take leave of this collection of essays, which we have read with pleasure and profit; and we hope that our mode of expressing our criticisms will not be misunderstood or supposed to indicate a want of appreciation. To touch on all the points we had marked for observation would more than double the length of this review. Especially do we regret not being able to say a few words about "The Æsthetic Aspects of Character." If Mr. Sully could admit that conduct cannot be beautiful in so far as it involves struggle, mental effort, for example, in so far as it is moral or virtuous on the subjective side, very little would then stand between him and one commanding generalisation.

DOUGLAS A. SPALDING

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

Sounding and Sensitive Flames*

II.

ANOTHER example of a highly sensitive flame was recently described to me which seems to show that air-currents flowing through gauze at a proper speed are sensitive without the intervention or simultaneous superaddition of a flame. A special kind of Bunsen burner was made with a spiral mixing tube coiled in an inverted cup, at the centre of which is a small chamber covered with wire-gauze at the foot of a short tube or flame-pipe. The gas is admitted by a single jet passing through a cap of wire-gauze covering the conical opening of the spiral tube, the object of this cap of gauze being to distribute the air in its approach, and to protect the gas-jet from ignition. The gas-flame burns with a small bright green cone, surmounted by a larger envelope of pale reddish flame, and it is intensely hot. The green cone indicates combustion of the most complete explosive mixture of air and coal-gas, and when the burner is properly adjusted it can only burn on the top of the flame-tube, where it finds the additional required supply of oxygen; but it descends to the wire-gauze at the foot of the tube if the air-supply exceeds, or the gas supply falls short of the right proportion. In some of these burners the slightest noise of the kind that commonly affects sensitive flames causes the cone of green flame to retreat into the tube and settle on the wire-gauze at its foot, whence it rises again immediately to the top of the tube, when the sound ceases. The explanation seems to be that the air-current entering the mixing-tube through the outer gauze cap is in a sensitive condition, and that when thrown into disturbance by the external sounds, it is more quickly seized and is drawn into the mixing-tube more rapidly by the gas-jet than when it is flowing over the jet in a tranquil state. The inventor of these burners, Mr. Wallace, assures me that some of them exhibit the most sensitive of sensitive flames, and that he has more than once thought of sending one of them as a most singularly effective illustration of such flames to Prof. Tyndall.

The explanation here given of the sensitiveness of Wallace's Bunsen-flame appears to be in great part correct; but the behaviour of the flame, which by Mr. Wallace's kindness I have seen since the above was written, differs considerably from that described; and some experiments connected with it lead me to modify to some extent the foregoing theory of the origin of sensitiveness in wire-gauze flames, and even, apparently, to except the gauze itself from any considerable share of mechanical action in the process. The gas in this burner is first turned low, until the green cone at the centre nearly disappears, and merges into the outer border of the flame from less effective mixture of air with the gas at a low speed of the jet. The flame is now sensitive to the smallest sound, mounting fully one-half higher at every word, or even syllable of a speaker, and at the stroke of a bell, or other acute sound, reaching about twice its ordinary height. It undergoes at the same time no change in its appearance, showing that the contents of the mixing-tube and chamber are merely urged out of the flame-tube with greater speed by some forward impulse of the jet behind. If the sound is continued, as by constantly ringing a bell, the expanded flame gradually subsides, from the expulsion of all the inferior gas-mixture in the burner, reaches its first stature, and passes into a condition of more concentrated combustion corresponding to a fuller, and therefore more rapid admission of gas to the jet; when the sound ceases, the contracted flame gradually recovers its first size and diffuseness from the same cause, namely, the expulsion of all the well-aërated gas

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* NATURE, vol. ix. p. 179: "The Relation of Body and Mind."

* Continued from p. 6.

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